

AMENDMENT TO THE CLAIMS:

1. (Canceled)

2. (Canceled)

3. (Currently Amended) ~~The retaining ring of claim 2~~

A retaining ring for chemical mechanical polishing (CMP) apparatus comprising:

a body of said retaining ring;

and

a single trigger cavity; said single trigger cavity further including:

an O-ring covering said single trigger cavity;

wherein said trigger cavity is formed inside said body of said retaining ring; and wherein said trigger cavity is configured to indicate that thickness of said retaining ring is less than or equal to a predetermined thickness threshold, and wherein said single trigger cavity extends inside said body of said retaining ring at a depth level that is greater than or equal to a threshold depth level corresponding to a predetermined thickness threshold; and wherein said single trigger cavity is filled with gas; and wherein said O-ring prevents said gas from escaping from said trigger cavity; and wherein said gas is selected from the group consisting of: {air, Helium, Neon, Argon, Krypton , and Xenon}.

4. (Currently Amended) ~~The retaining ring of claim 2~~

A retaining ring for chemical mechanical polishing (CMP) apparatus
comprising:

a body of said retaining ring;

and

5 a single trigger cavity; wherein said single trigger cavity further
includes:

an O-ring covering said single trigger cavity;

10 wherein said trigger cavity is formed inside said body of said retaining
ring; and wherein said trigger cavity is configured to indicate that thickness of
said retaining ring is less than or equal to a predetermined thickness threshold,
and wherein said single trigger cavity extends inside said body of said retaining
ring at a depth level that is greater than or equal to a threshold depth level
corresponding to a predetermined thickness threshold; and wherein said single
15 trigger cavity is filled with fluid; and wherein said O-ring prevents said fluid
from escaping from said trigger cavity; and wherein said fluid is selected from
the group consisting of: {tap water, alcohols, glycols and water mixes}.

5. (Canceled)

6. (Canceled)

20 7. (Canceled)

8. (Currently Amended) ~~The retaining ring of claim 5 further including:~~

A retaining ring for chemical mechanical polishing (CMP) apparatus
comprising:

a body of said retaining ring;

an integer N of trigger cavities;

and

an integer M of O-rings, each said O-ring covering one said trigger
cavity;

wherein a first trigger cavity is formed inside said body of said retaining
ring; said first trigger cavity configured to indicate that thickness of said
retaining ring is less than a first predetermined thickness threshold;

and wherein a second trigger cavity is formed inside said body of said
retaining ring; said second trigger cavity configured to indicate that thickness
of said retaining ring is less than a second predetermined thickness threshold;

and wherein each i-th trigger cavity is formed inside said body of said
retaining ring; each said i-th trigger cavity configured to indicate that thickness
of said retaining ring is less than an i -th predetermined thickness threshold; i
being an integer less than or equal to N; and

wherein each said trigger cavity covered with one said O-ring is filled
with gas; and wherein each said O-ring prevents said gas from escaping from
one said trigger cavity; and wherein said gas is selected from the group
consisting of: {air, Helium, Neon, Argon, Krypton, and Xenon}, said integer
M being less than or equal to N.

9. (Currently Amended) ~~The retaining ring of claim 5 further including:~~

A retaining ring for chemical mechanical polishing (CMP) apparatus
comprising:

a body of said retaining ring;

an integer N of trigger cavities;

and

an integer L of O-rings, each said O-ring covering one said trigger

cavity;

wherein a first trigger cavity is formed inside said body of said retaining ring; said first trigger cavity configured to indicate that thickness of said retaining ring is less than a first predetermined thickness threshold;

wherein a second trigger cavity is formed inside said body of said retaining ring; said second trigger cavity configured to indicate that thickness of said retaining ring is less than a second predetermined thickness threshold; and wherein each i-th trigger cavity is formed inside said body of said retaining ring; each said i-th trigger cavity configured to indicate that thickness of said retaining ring is less than an i -th predetermined thickness threshold; i being an integer less than or equal to N; and

wherein each said trigger cavity covered with one said O-ring is filled with fluid; and wherein each said O-ring prevents said fluid from escaping from one said trigger cavity; and wherein said fluid is selected from the group consisting of: {tap water, alcohols, glycols and water mixes}, said integer L being less than or equal to N.

10. (Original) A method of replacing a retaining ring in a chemical mechanical polishing (CMP) apparatus, said retaining ring comprising a single trigger cavity formed inside said body of said retaining ring, and an O-ring covering

said single trigger cavity; wherein each said trigger cavity covered with said O-ring is filled with gas; and wherein said O-ring prevents said gas from escaping from said trigger cavity; and wherein said gas is selected from the group consisting of: {air, Helium, Neon, Argon, Krypton, and Xenon}; said method comprising the steps of:

(A) filling said trigger cavity with said gas having a predetermined air pressure;

(B) substantially continuously measuring and maintaining said predetermined air pressure of said gas in said trigger cavity;

(C) performing a chemical mechanical polishing operation on a wafer by using said CMP apparatus having said retaining ring with said single trigger cavity under control of a computer loaded with a chemical mechanical polishing computer program;

(D) if said air pressure in said single trigger cavity changes beyond a predetermined threshold level, using said chemical mechanical polishing computer program to stop said process of performing said chemical mechanical polishing operation on said wafer;

(E) replacing said retaining ring;

and

(F) repeating said steps (A-E).

11. (Original) The method of claim 10; wherein said step (A) further includes the step of:

(A1) pumping into said trigger cavity said gas having a predetermined

positive air pressure by using said gas compressor; wherein said predetermined positive air pressure is greater than a normal air pressure; and wherein said step (D) further includes the step of:

(D1) if said air pressure in said single trigger cavity drops below a first predetermined threshold level, using said chemical mechanical polishing computer program to stop said process of performing said chemical mechanical polishing operation on said wafer.

12.(Original) The method of claim 10; wherein said step (A) further includes the step of:

(A2) pumping into said trigger cavity said gas having a predetermined negative air pressure by using a vacuum pump; wherein said predetermined negative air pressure is less than a normal air pressure; and wherein said step (D) further includes the step of:

(D2) if said air pressure in said single trigger cavity increases above a second predetermined threshold level, using said chemical mechanical polishing computer program to stop said process of performing said chemical mechanical polishing operation on said wafer.

13. (Original) A method of replacing a retaining ring in a chemical mechanical polishing (CMP) apparatus, said retaining ring comprising a single trigger cavity formed inside said body of said retaining ring, and a O-ring covering said single trigger cavity; wherein said trigger cavity covered with said O-ring is filled with fluid; and wherein said O-ring prevents said fluid from escaping

from said trigger cavity; and wherein said fluid is selected from the group consisting of: {tap water, alcohols, glycols and water mixes}; said method comprising the steps of:

(A) filling said trigger cavity with said fluid having a predetermined fluid pressure by using a fluid pump;

(B) substantially continuously measuring and maintaining said fluid pressure of said fluid in said trigger cavity;

(C) performing a chemical mechanical polishing operation on a wafer by using said CMP apparatus having said retaining ring with said single trigger cavity under control of a computer loaded with a chemical mechanical polishing computer program;

(D) if pressure of said fluid pressure in said single trigger cavity drops below a predetermined threshold level, using said chemical mechanical polishing computer program to stop said process of performing said chemical mechanical polishing operation on said wafer;

(E) replacing said retaining ring;

and

(F) repeating said steps (A-E).

14. (Original) A method of replacing a retaining ring in a chemical mechanical polishing (CMP) apparatus; said retaining ring comprising: a body; an integer N of trigger cavities; and an integer M of an O-rings; each said O-ring covering one said trigger cavity; wherein each said trigger cavity covered with one said O-ring is filled with gas; and wherein each said O-ring prevents said

gas from escaping from one said trigger cavity; and wherein said gas is selected from the group consisting of: {air, Helium, Neon, Argon, Krypton, and Xenon}; wherein said first trigger cavity extends inside said body of said retaining ring at a first depth level L_1 ; wherein said second trigger cavity
5 extends inside said body of said retaining ring at a second depth level L_2 ; and wherein each said k-th trigger cavity extends inside said body of said retaining ring at a k-th depth level L_k ; wherein $L_1 \geq L_2 \geq \dots L_k \dots \geq L_N$, k being an integer less than or equal to N; said method comprising the steps of:

(A) filling each said trigger cavity with one said gas;

10 (B) substantially continuously measuring air pressure in each said trigger cavity;

(C) performing a chemical mechanical polishing operation on a wafer by using said CMP apparatus having said retaining ring with said plurality of trigger cavities under control of a computer loaded with a chemical mechanical
15 polishing computer program;

(D) if air pressure in said i-th trigger cavity changes beyond an i-th predetermined threshold level, using said chemical mechanical polishing computer program to issue an i-th warning signal; i being an integer less than
N;

20 (E) repeating said step (D) for each said i-th trigger cavity;

(F) if air pressure in said N-th trigger cavity changes beyond an N-th predetermined threshold level, using said chemical mechanical polishing computer program to stop said process of performing said chemical mechanical polishing operation on said wafer;

(G) replacing said retaining ring;

and

(H) repeating said steps (A-G).

5 15. (Original) A method of replacing a retaining ring in a chemical mechanical polishing (CMP) apparatus; said retaining ring comprising: a body; an integer N of trigger cavities; and an integer M of an O-rings; each said O-ring covering one said trigger cavity; wherein each said trigger cavity covered with one said O-ring is filled with fluid; and wherein each said O-ring prevents said
10 fluid from escaping from one said trigger cavity; and wherein said fluid is selected from the group consisting of: {tap water, alcohols, glycols and water mixes}; wherein said first trigger cavity extends inside said body of said retaining ring at a first depth level L_1 ; wherein said second trigger cavity extends inside said body of said retaining ring at a second depth level L_2 ; and
15 wherein each said k-th trigger cavity extends inside said body of said retaining ring at a k-th depth level L_k ; wherein $L_1 \geq L_2 \geq \dots L_k \dots \geq L_N$, k being an integer less than or equal to N; said method comprising the steps of:

(A) filling each said trigger cavity with one said fluid;

(B) substantially continuously measuring and maintaining a fluid pressure
20 in each said trigger cavity;

(C) performing a chemical mechanical polishing operation on a wafer by using said CMP apparatus having said retaining ring with said plurality of trigger cavities under control of a computer loaded with a chemical mechanical polishing computer program;

(D) if pressure of said selected fluid in said i-th trigger cavity drops below an i-th predetermined threshold, using said chemical mechanical polishing computer program to issue an i-th warning signal; i being an integer less than N;

5 (E) repeating said step (D) for each said i-th trigger cavity;

(F) if pressure of said selected fluid in said N-th trigger cavity drops below an N-th predetermined threshold, using said chemical mechanical polishing computer program to stop said process of performing said chemical mechanical polishing operation on said wafer;

10 (G) replacing said retaining ring;

and

(H) repeating said steps (A-G).

16. (Original) A chemical mechanical polishing (CMP) apparatus comprising a
15 retaining ring further comprising at least one trigger cavity formed inside said body of said retaining ring, and at least one an O-ring, each said O-ring covering one said single trigger cavity; wherein each said trigger cavity covered with one said O-ring is filled with gas; and wherein each said O-ring prevents said gas from escaping from one said trigger cavity; and wherein said
20 gas is selected from the group consisting of: {air, Helium, Neon, Argon, Krypton, and Xenon}; said CMP apparatus comprising:

a means for filling each said trigger cavity with said gas having a predetermined air pressure;

a means for substantially continuously measuring and maintaining said air

pressure of said gas in each said trigger cavity;

a means for performing a chemical mechanical polishing operation on a wafer by using said CMP apparatus having said retaining ring with at least one said single trigger cavity;

a means for issuance warning signals;

a means for stopping said (CMP) apparatus;

and

a means for replacing said retaining ring with said at least one trigger cavity.

17. (Original) A chemical mechanical polishing (CMP) apparatus comprising a retaining ring further comprising at least one trigger cavity formed inside said body of said retaining ring, and at least one O-ring, each said O-ring covering one said trigger cavity; wherein each said trigger cavity covered with one said O-ring is filled with fluid; and wherein each said O-ring prevents said fluid from escaping from one said trigger cavity; and wherein said fluid is selected from the group consisting of: {tap water, alcohols, glycols and water mixes}; said CMP apparatus comprising:

a means for filling each said trigger cavity with said fluid having a predetermined fluid pressure;

a means for substantially continuously measuring and maintaining said fluid pressure of said fluid in each said trigger cavity;

a means for performing a chemical mechanical polishing operation on a wafer by using said CMP apparatus having said retaining ring with at least one

• said single trigger cavity;

• a means for issuance warning signals;

a means for stopping said (CMP) apparatus;

and

• 5 a means for replacing said retaining ring with said at least one trigger
cavity.

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